Patent Claims

1. A bidirectional transmitting and receiving device, comprising:

a transmitting component comprising an emission area of a first size;

a receiving component comprising a receiving area of a second size; and

coupling optics configured to couple light between the transmitting component and the receiving component on the one hand, and an optical waveguide to be coupled thereto on the other hand,

wherein the coupling optics comprise two imaging systems that are arranged one behind the other such that the light that is emitted from the transmitting component is imaged by the first imaging system on an intermediate plane on which the receiving component is located, and in the process passes through the receiving component or passes by it at a side thereof, and

wherein the second imaging system images firstly the light that is emitted by the transmitting component from the intermediate plane onto an end surface of the optical waveguide, and images secondly the light that is emitted by the optical waveguide onto a receiving area of the receiving component.

2. The device as claimed in claim 1, wherein the second imaging system is arranged with respect to the first imaging system such that an image plane for the imaged light from the end surface of the optical waveguide lies on the same plane as the intermediate plane of the first imaging system.

3. The device as clamed in claim 1, wherein the image of the transmitting component on the intermediate plane is imaged within the end surface of the optical waveguide by the second imaging system.

4. The device as claimed in claim 1, wherein the light that is emitted from the transmitting component is injected into a comparatively small subregion of the end surface of the optical waveguide, while the light that is to be received and is distributed over the entire end surface of the optical waveguide is imaged onto the receiving area of the receiving component.

5. The device as claimed in claim 1, wherein the image of the transmitting component on the intermediate plane is smaller than one third of the receiving area of the receiving component.

6. The device as claimed in claim 1, wherein the first or the second imaging system produces an enlarged or smaller image at the intermediate plane.

7. The device as claimed in claim 1, wherein the second imaging system comprises a diffractive lens that focuses light at different wavelengths differently, with the intermediate plane on which the light from the transmitting component is imaged being located at the focus of the diffractive lens for the emitted wavelength, so that the light that is emitted from the transmitting component is imaged on the end surface of the optical waveguide, while the receiving component is located away from the focus of the diffractive lens for the received light that is emitted from the optical waveguide at the second wavelength, whereby such received light is imaged at the intermediate plane in such a manner that it is widened again or has not yet been focused.

8. The device as claimed in claim 1, wherein the receiving component is substantially transparent for the wavelength that is emitted from the transmitting component.

9. The device as claimed in claim 8, wherein the receiving area of the receiving component comprises an inactive region through which the light that is emitted from the transmitting component passes.

10. The device as claimed in claim 1, wherein the receiving component comprises a cutout with a comparatively small area compared to the receiving area, through which the light that is emitted from the transmitting component passes.

11. The device as claimed in claim 1, wherein the first imaging system is formed on one face of a substrate, on whose opposite face the receiving component is arranged or formed..

12. The device as claimed in claim 1, wherein the transmitting component, the first imaging system, and the receiving component are encapsulated with a transparent plastic encapsulation material that forms the second imaging system.

13. The device as claimed in claim 12, wherein the plastic encapsulation material additionally forms a coupling area for an optical waveguide.

14. A bidirectional optical system, comprising:

a transmitting component comprising an emission area having a first area associated therewith;

an optical waveguide having an end surface associated therewith facing the transmitting component;

a receiving component disposed between the transmitting component and the optical waveguide, and comprising a receiving area having a second area associated therewith;

a first imaging system disposed between the transmitting component and the receiving component, and configured so that light from the transmitting component is imaged on an intermediate plane at which the receiving component is located; and

a second imaging system disposed between the optical waveguide and the receiving component, and configured to image emitted light from the transmitting component onto a portion of the end surface of the optical waveguide, and image light from the optical waveguide onto the receiving area of the receiving component.

15. The optical system of claim 14, wherein the second imaging system is arranged with respect to the first imaging system such that an image plane for the image light from the end surface of the optical waveguide lies on the intermediate plane.

16. The optical system of claim 14, wherein the second area is larger than the first area.

17. The optical system of claim 14, wherein the second imaging system comprises a diffractive lens operable to focus light of differing wavelengths at differing distances therefrom.

18. The optical system of claim 17, wherein the diffractive lens comprises a fresnel lens.

19. The optical system of claim 17, wherein light from the optical waveguide has a wavelength that is greater than light emitted from the transmitting component, and wherein the intermediate plane is located at the focus of the diffractive lens for the light from the transmitting component, and wherein the intermediate plane is located in front of or beyond the

focus of the diffractive lens for the light emitted from the optical waveguide.

20. The optical system of claim 14, wherein light emitted from the end surface of the optical waveguide substantially fills an end surface area associated therewith, and wherein the second imaging system is configured to focus the optical waveguide emitted light onto the intermediate plane associated with the receiving area, and wherein the light transmitted from the transmitting component is imaged onto the receiving component via the first imaging system with an area associated with the emission area, wherein the emission area is substantially less than the receiving area, and wherein the transmitted light is further imaged to the end surface of the optical waveguide via the second imaging system with an area thereat that is substantially less than the end surface area.